February 15, 1990

Carl G. Kitz
Environmental Protection Agency
1200 Sixth Avenue, HW-113
Seattle, WA 98101

Ref: TDD T10-9001-005

Dear Carl:

Enclosed please find a preliminary assessment of the applicability of soil washing and stabilization/solidification treatment technologies for the remediation of the Cliff's Battery Service Removal site. A preliminary review of using off-site thermal incineration of the lead-contaminated soil indicated this was not a feasible option. This technology is used mainly for the oxidation of organic compounds not non-volatile inorganic metals. It also presents problems for the gaseous discharge of metals without complex air pollution control systems. The other two technologies are described below based on the process, advantages, disadvantages, tests required and cost estimates. The primary reference for this review was from the Treatment Technologies Evaluation Report for Standard Steel, Anchorage, Alaska.

1) Soil Washing

Process Description

Soil washing removes contaminants from excavated soils by liquid extraction using a chelating agent such as, ethylenediaminetetraacetic acid (EDTA) to seperate the metals (lead) from the soil. The washing solution containing the EDTA and lead complex is treated with sulfide or hydroxide to precipitate the lead from solution. The washing solution is then recycled for further treatment of the contaminated soil. The lead precipitate can be treated, recycled or disposed of.

The process is conducted on site using mobile equipment. The soil must be excavated and screened to remove the battery casings and gravel. The soil is then placed in the extraction vessel, where it is mixed with the washing solution. The treated soil is then discharged for on site use as back fill in the excavated area. The washing solution is regenerated and reused in the process which is economically efficient. The lead precipitate can be treated further for recycling which would

off set the costs of the removal or it can be disposed of at a RCRA approved landfill. However, the significant waste volume reduction of the lead contaminated soil versus the lead precipitate would reduce the disposal and transportation costs considerably.

Tests Required

Soil treatability studies would be necessary to determine the sizing of the equipment, composition of the washing solution, throughput of the system and efficiency. Bench scale tests would require a representative sample of the waste to be tested for soil type, grain size distribution and lead concentration. Costs of these feasibility studies typically range from $10,000 to $70,000 and may require a month or more to complete.

Vendors

MTA Remedial Resources, Inc., Golden, CO
Mr. Paul Trost, (303) 279-4255

Chemical Waste Management, Inc., Oakbrook, IL
Mr. Greg Gilles, (708) 513-4500

IT Corp., Martinez, CA
Mr. John Melnyc, (415) 372-9100

Availability/Mobilization

MTA Remedial Resource, Inc., and IT Corp., have mobile units available at this time but the specific sizing of the equipment is contingent on the outcome of the feasibility study. Chemical Waste Management, Inc., is currently pursuing inorganic contaminant applications in the laboratory, but do not have any mobile units for field applications at this time.

Costs

The estimated costs of the MTA Remedial Resources, Inc. soil washing processes are $150-250/ton. Based on the 3100 ton estimate of the soil to be treated the costs would range from $465,000 - $775,000.

Advantages

- o On-site solution;
- o Significant waste reduction; and
- o Low cost

Disadvantages

- o Innovative technology, i.e., not field demonstrated;
- o Feasibility is site-specific with treatability studies required;
- o Unavailability of full-scale systems; and
- o Separation/concentration process only- contaminants must be recycled, treated or disposed of.

2) Stabilization/Solidification

Process Description

Stabilization/Solidification is primarily used to treat contaminated soils and sludges by physically or chemically immobilizing the contaminants in a solid matrix or monolith. Thereby, mitigating the threat to public health and the environment via contaminant migration. The stabilization process renders the contaminants immobile by chemical means (i.e., by chemical bonding to the solid matrix). The solidification process renders the contaminants immobile by physical means (i.e., by microencapsulation). Additional measures (i.e., capping) may be required to inhibit leaching of the solid matrix into the groundwater.

Although different compounds and concentrations are used, all processes utilize silicate (pozzolanic) materials such as fly ash, cement-kiln dust, or blast furnace slag, mixed with a settling agent such as lime, cement or gypsum. The settling agent contains polyvalent metal ions such as aluminum or iron. These processes typically use other additives to decrease leaching of the contaminants from the monolith.

Pozzolanic stabilization/solidification is conducted on site using mobile equipment. The soil is excavated and placed in a mixer with measured amounts of the cement-like materials. The treated product can then be pumped to the final disposal area. Systems on the market can usually process up to ~~1,000~~ 560 cubic yards of contaminated soil per day.

Tests Required

Information needed for the sucessful application of this alternative includes the determination of soil type(s), grain size distribution, and chemistry (i.e., % moisture, organic content, pH). The identification of the feed preparation operations (i.e., grinding, sieving) will also be required. In addition, the chemistry and the hydraulics of the groundwater beneath the site should be characterized due to long term contact of the solidified soils with the groundwater. These bench scale tests normally require from 3 weeks to 8 weeks to complete. Depending on the vendor and the physical performance characteristics specified for the solidified soil (i.e. compressive strength, permeability, resistance to wet-dry and freeze-thaw cycling), a one to five liter representative sample of the contaminated soil will be required. Costs 1 2(((

Vendors

On Site, Inc., Bennett, CO
Raymond Beherns, (303) 664-4129

Chemical Waste Management, Inc., Chicago, IL
Ray Bock, ~~(312)~~ 708 218-1675

John Kuper

Availability/Mobilization

If a system is available when requested, mobilization of the system would require at least one week. It would require approximately four days to process 3100 tons of soil. This time frame does not include time to develop the formulation of the cement-like mixture or construction of a TSCA/RCRA approved landfill on site, if required.

Costs

$125-150/ton

The costs of excavation, treating the soil, and routine testing are estimated at $92/ ton for the On Site, Inc. process. The cost of transportation of equipment and personnel to and from the site, and setup are not included.

$387,500 - 465,000

Advantages

- o On-site solution;
- o Reduced mobility of metals;
- o Demonstrated technology; and
- o No pretreatment of the soil is needed.

Disadvantages

- o Long term stability and resistance to leaching unknown;
- o May require long term groundwater monitoring;
- o Metals are not destroyed; and
- o Materials such as borates, sulfates and carbohydrates may interfere with the process.

Sincerely,

Richard W. Fullner
TAT Leader

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Enclosure